

ACCESSION #: 9908260087

NON-PUBLIC?: N

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Calvert Cliffs Nuclear Power Plant, Unit 1 PAGE: 1 OF 4

DOCKET NUMBER: 05000317

TITLE: Reactor Trip Due to Main Transformer Bushing Flashover

EVENT DATE: 07/24/1999 LER #: 1999-004-00 REPORT DATE: 08/23/1999

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J. K. Kirkwood TELEPHONE: (410) 495-2013

COMPONENT FAILURE DESCRIPTION:

CAUSE: C SYSTEM: 0 COMPONENT: 0 MANUFACTURER: E120

REPORTABLE EPIX: Y

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 1438 on July 24, 1999, Unit 1 tripped from 100 percent power due to electrical arcing (flashover) across the No. 12 Main Transformer (U-25000-12) A-phase 500 kV bushing. The main generator output breaker opened, and the Unit 1 Reactor tripped on loss of turbine load.

A thunderstorm was in progress at the time of the Unit trip with high winds and heavy rain. Witnesses observed a lightning strike near the affected transformer. Lightning apparently struck the A-phase 500 kV transmission line near the transformer, increasing the electrical potential beyond the insulating capabilities of the bushing, creating an

electrical arc around the bushing. The arcing across the A-phase bushing affected the A-phase current flow. Protective relays sensed the abnormal condition, and opened two Switchyard Breakers (552-22 and 552-23), the Generator Field Breaker, and the Exciter breaker.

Operators responded appropriately and plant systems functioned as designed. The plant was brought to a safe shutdown condition.

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I. DESCRIPTION OF EVENT

During a thunderstorm on July 24, 1999, at 1438, Unit 1 tripped from 100 percent power due to flashover across the No. 12 Main Transformer A-phase, 500 kV (U-25000-12) bushing. The A-phase bushing (H-1, A-phase, Westinghouse Type-O Condenser bushing) apparently flashed-over due to weather-related effects. A security guard saw lightning strike near the main transformer immediately before seeing the A-phase bushing flashover. Another security guard with a different view also reported a lightning strike in the vicinity of the main transformer.

The transformer is a link between the turbine generator (EUIS HA-TG) and the 500 kV transmission lines leaving the plant. The turbine generator tripped on transformer high-side leads differential (indicating that there was an imbalance between phases). The reactor tripped on loss of turbine load on all four channels of the Reactor Protective System. All eight reactor trip breakers actuated, and the reactor was brought to a safe shutdown condition. No engineered safety feature systems were actuated during this event.

II. CAUSE OF EVENT

The Unit 1 Reactor trip was caused by the flashover of the U-25000-12, A-phase 500 kV bushing. The bushing apparently flashed over due to the A-phase voltage increasing beyond the insulating capabilities of the bushing caused by lightning striking the A-phase conductor.

A thunderstorm was in progress at the time of the reactor trip. High winds, heavy rain, and frequent lightning accompanied the storm. Two security guards witnessed a lightning strike in the vicinity of the affected transformer. one security guard witnessed arcing across the A-phase 500 kV bushing immediately after the lightning strike.

The arc across the bushing created an imbalance in the A-phase transformer output. The "High Side Leads Differential Current" and the "Main Generator Differential/Ground" protective relay circuits opened switchyard breakers 552-22 and 552-23 which isolated both Unit 1 main transformers from the switchyard, and opened the main generator field breaker and exciter breaker, causing a loss of load turbine trip and Reactor Protective System trip.

Post-event inspections of the affected transformer found a black scorch mark and holes at the top of the A-phase bushing, and a black scorch mark at the base of the bushing. There were also scorch marks on some of the transformer deluge system heat sensors and spray nozzles located near the A-phase bushing. There was no evidence of a "direct-hit" lightning strike in the area of the A-phase bushing.

Post-event testing of the A-phase bushing indicated no internal damage to

the bushing, eliminating bushing failure as a cause of the event.

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III. ANALYSIS OF EVENT

There was no undue risk to the health and safety of any member of the general public, or risk of exposure to ionizing radiation to any individual from this event. Protective relays and circuit breakers operated as designed, and the unit was brought to a safe shutdown condition without further incident. Operators responded appropriately, and plant systems functioned as designed to stabilize the plant.

Plant Design Engineers concluded that the Lightning Protection system functioned as designed. This conclusion is based on recorded voltage and current waveform traces of the 500 kV system, and the lack of any major physical damage to the electrical hardware, structures, and ground in the vicinity of the transformer U-25000-12.

The lightning created a voltage potential surge on the A-phase. The increased potential resulted in an electrical arc from the high potential at the top of the A-phase bushing to the base of the bushing and other nearby metal components at ground potential. Evidence shows that the Lightning Protection functioned to prevent severe physical damage from the lightning. The A-phase 500 kV bushing of the No. 11 Main Transformer was not damaged. A-phase 500 kV transmission insulators were also undamaged. This event is reportable in accordance with 10 CFR 50.73(a)(2)(iv), Any event or condition that resulted in a manual or automatic actuation of any

engineered safety feature including the Reactor Protective System.

IV. CORRECTIVE ACTIONS

Immediate

- A. The Number 11 and 12 Main Transformers, the main generator, protective relays, and lightning protection were tested for satisfactory performance. All components performed satisfactorily.
- B. The damaged A-phase secondary bushing was replaced.
- C. Unit 1 was restarted on Monday, August 2, 1999. Long-Term
- D. The lightning protection system will be evaluated for adequacy and acceptability.

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V. ADDITIONAL INFORMATION

A. Component Identification

Component IEEE 803 IEEE 805

EIIS Function System ID

A-phase bushing INS EL

B. Previous Similar Events

In 1987, an event similar to this event occurred involving flashover of the "C"-phase bushing of the same transformer (U-25000-12) during a snowstorm.

Details of the event are recorded in Licensee Event Report Number 317/87-015.

PETER E. KATZ Baltimore Gas and Electric Company

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BGE August 23, 1999

U.S. Nuclear Regulatory Commission

Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant

Unit No. 1; Docket No. 50-317; License No. DPR 53

Licensee Event Report 99-004

Reactor Trip Due to Main Transformer Bushing Flashover

The attached report is being sent to you as required under 10 CFR 50.73

guidelines. Should you have questions regarding this report, we will be

pleased to discuss them with you.

Very truly yours,

for

Peter E. Katz

Plant General Manager

PEK/JKK/bjd

Attachment

cc: R. S. Fleishman, Esquire H. J. Miller, NRC

J. E. Silberg, Esquire Resident Inspector, NRC

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